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10/038,367	10/19/2001	Mohammad Usman	0037203-5	6970

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EXAMINER	
SINGH, RAMNANDAN P	

ART UNIT	PAPER NUMBER
2646	

DATE MAILED: 06/15/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/038,367	USMAN ET AL.	
	Examiner	Art Unit	
	Ramnandan Singh	2644	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-12 and 14-18* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *14-16* is/are allowed.

6)☒ Claim(s) *1-7,9-12,17 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 January 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed on Jan 16, 2005 have been fully considered but they are not persuasive.

Applicant's argument---"Applicant authored claim 1 using the conventional patent practice of referring to differing coefficients as being "first" or "second". Examiner has literally mapped the term 'first and "second" to the varied usage in the patent, rather than appreciate that "first" simply refers to one of set of coefficients and "second" refers to a different set of coefficients. Applicant believes that such a mapping is unwarranted and is contrary to standard practice.

Examiner's response---Examiner respectfully disagreed. The Applicant's specification has clearly laid out selecting a **first set of taps** out of N taps and the remaining taps as a **second set of taps** from a truncated FIR filter; and converting the second set of the FIR taps into an IIR coefficients [Page 10, lines 10-19]. Mixing the conventional patent practice and the specification's definition merely adds to confusion. For clarity, see Applicant's amended Fig. 1. It is, therefore, necessary that claims must be **unambiguous** in light of the specification and figures.

Drawings

2. Amendment to Fig. 1 is approved.

Specification

3. Corrections to the specification are approved.

4. **Status of Claims**

Claims 1-7, 10-12, 14-17 are amended.

Claims 8 and 13 are cancelled.

Claims 1-7, 9-12, 14-18 are pending.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1, 4, 7, 9-12, 17-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1 recites the limitation "converting said FIR filter into an infinite impulse response (IIR) filter". The term "converting said FIR filter" is ambiguous because it may convert either all the coefficients or some coefficients of the FIR into an IIR filter. This claim does not specify distinctly, as shown in amended Fig. 1, "dividing said FIR coefficients into a first set of FIR coefficients and a second set of FIR coefficients; and converting said second set of the FIR coefficients into IIR filter coefficients".

A similar thing holds for claims 4, 7, 9-12 and 17-18.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claims 1-4, 6-7, 12 are rejected under 35 U.S.C. 102(b) as being anticipated by Gysel et al [US 5,633,863].

Regarding claim 1, Gysel et al teach an adaptive filter shown in Fig. 1, the adaptive filter comprising :

a filter input, **SS**, for receiving a first signal;

a filter output, **Y**, for outputting a second signal upon the first signal, to a summation device ,**DAD**;

an error input, **ES**, for receiving an error input signal generated by a comparison of the second signal against a third signal (i.e. **output of AD)** [col. 5, lines 18-45]; and

a plurality of first coefficients, b_1, b_2,..., b_m, [Fig. 10] having plurality of poles and zeroes wherein the first coefficients are determined by deriving a finite impulse response (FIR) filter having a predetermined number of second coefficients [col. 3, lines 58-63], obtaining convergence of the second coefficients, converting the FIR filter section having the first coefficients into an infinite impulse response (IIR) filter [see Fig. 10], and updating the zeroes of the first coefficients based upon the error input signal

while concurrently maintaining the poles of the first coefficients in a fixed state (i.e. **poles of the IIR filter are not changed during operation)** [col. 4, lines 20-24; col. 13, line 65 to col. 14, line 26; col. 18, lines 6-56].

Claims 4, 7, and 12 are essentially similar to claim 1 and are rejected for the reasons stated above.

Regarding claim 2, Gysel et al further teach applying a Least-Mean Square (LMS) algorithm to achieve the asymptotic convergence of the second coefficient (i.e. FIR filter) [col. 5, lines 46-57].

Claim 6 is essentially similar to claim 2 and is rejected for the reasons stated above apropos of claim 2.

Regarding claim 3, Gysel et al further teach updating (i.e. **optimally adapting)** the zeroes of the first coefficients (i.e. **zeroes of the IIR filter**) using a Least-Mean Square (LMS) algorithm [col. 14, lines 20-26; col. 5, lines 46-57].

Claim Rejections - 35 USC § 103

9. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Johnson [US 6,141,406] in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 9, Johnson teaches a method for canceling an echo using an adaptive finite impulse response (FIR) filter shown in Fig. 15, comprising the steps of :

receiving a first signal, x(n);

outputting a second signal, y(n), wherein the second signal is a function of the filter coefficients and the first signal, x(n); and

receiving an error signal, error(n), generated by a comparison of the second signal, y(n), against a third signal from a remote audio source [Fig. 1b; col. 6, lines 28-38; col. 4, lines 61-65].

Although Johnson teaches **an alternative method** using an adaptive infinite impulse response (IIR) filter wherein the output of the given FIR filter is the same as that of the IIR filter, he does not disclose expressly how an equivalent IIR filter is derived from a given FIR filter [col. 10, lines 28-33]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Johnson with an adaptive IIR filter [Johnson; col. 10, lines 31-33].

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li [US 6,549,587 B1] in view of Azriel [US 6,724,736 B1] and further in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 10, Li teaches a gateway 55(a) operative to transmit signal between a circuit-switched network 58 (i.e. **PSTN)** and a packet based network 56 shown in Fig. 5, comprising:

an echo cancellation device 70 (i.e. **echo canceller in Fig. 6)** whose block diagram is shown in Fig. 7, comprising:

a summing device 132 for summing a first signal 122(b) and a second signal 130a to produce an error signal 132(b) and;

an finite-impulse response (FIR) filter 130 comprising a filter input for receiving a third signal 126(a), a filter output for outputting the second signal 130a based upon the

third signal 126(a) to the summation device 132, an error input for receiving the error signal 132(b) [Abstract; Fig. 7; col. 15, lines 46; col. 65, lines 48-53].

As it is well-known , the above packet based network is digital network and one would naturally need a plurality of analog to digital (A/D) and digital to analog (D/A) converters at each receiving end and transmitting end of the network to enable to communicate. Since Li does not teach expressly these converters, one of the ordinary skill in the art would have been motivated to seek known embodiments to enable two-way communications over the network. It would, therefore, have been obvious to use any known set of A/D and D/A converters , such as that of Azriel, as the needed converters in LI.

Azriel teaches a plurality of A/D converter 95, D/A converter 93, A/D converter 107 and D/A converter 109, as shown in Fig. 4, to enable to communicate over a packet based network shown in Fig. 2 [col. 2, lines 6-10; col. 3, lines 24-33; col. 10, line 57 to col. 11, line 8].

Further, although Li teaches **an alternative method** using an adaptive infinite impulse response (IIR) filter wherein the output of the given FIR filter is the same as that of the IIR filter, he does not disclose expressly a structure of an IIR filter derived from a given FIR filter [col. 16, line 66 to col. 17, line 7; col. 25, lines 25-29; col. 26, lines 29-

31]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Li with an adaptive IIR filter [Li; col. 26, lines 29-31].

12. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable Sugiyama [US 20020101981 A1] in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 11, Sugiyama teaches a multi-channel echo cancellation system, as shown in Fig. 24, for substantially reducing the presence of a plurality of undesired frequencies in first signals, wherein the first signals are transmitted across a plurality of channels, comprising:

al least one summation device 129 operative in each of the channels [Abstract; Figs. 1, 2A; Para. 0003; 0007; 0019; 0022].

Although Sugiyama teaches **an alternative method** using an adaptive infinite impulse response (IIR) filter wherein the output of the given FIR filter is the same as that of the IIR filter, he does not disclose expressly how an equivalent IIR filter is derived from a given FIR filter [Para. 0066; 0127; 0128]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Sugiyama with an adaptive IIR filter [Sugiyama; Para. 0066; 0127; 0128].

13. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Strait [US 6,266,367 B1] in view of Williamson et al [IEEE Trans. on Signal Processing, Vol. 44, No. 6, June 1996; pp. 1418-1427].

Regarding claim 17, Strait teaches a channel equalizing system for equalizing signals received in at least one channel [col. 1, lines 6-12; col. 2, lines 13-29; col. 3, line 51 to col. 4, line 11], as shown in Fig. 3, comprising:

an adaptive filter 316 having a filter input fore receiving a first input 322; a filter output for outputting a second signal based on the first signal; an error input for receiving an error signal (not shown) [col. 2, lines 28-29]; and a plurality of first coefficients having a plurality of poles and a plurality of zeroes [col. 4, line 45 to col. 5, line 15; col. 5, line 54 to col. 6, line 47; col. 8, lines 41-51].

Although Strait teaches an adaptive infinite impulse response (IIR) filter and a finite impulse response filter (FIR), he does not disclose expressly deriving an IIR filter is derived from a given FIR filter [col. 4, lines 56-67]. So one of ordinary skill in the art would have been motivated to seek any known method suitable to convert an FIR filter into an IIR filter, such as Williamson et al.

Williamson et al teach a method comprising:

converting a given FIR filter having a set of poles and zeroes into an equivalent IIR filter, called dubbed fixed pole adaptive filter (FPAF) and;

updating only the zeroes of the IIR filter based upon the error signal maintaining the poles unchanged [page 1420, left column, Theorem 2].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Williamson et al to convert a given FIR filter into an IIR filter. Thus it would have been possible to implement the adaptive FIR filter of Strait with an adaptive IIR filter to avoid a FIR filter having a very large number of taps in order to cancel long impulse responses [Williamson et al; page 1418, left column].

Claim 18 is essentially similar to claim 2 and is rejected for the reasons stated above apropos of claim 17.

14. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gysel et al [US 5,633,863] as applied to claim 4 above, and further in view of Dowling [US 6,507,732 B1] and further in view of Kaelin et al [IEEE Int. Symp. on Circuits and Systems, 1993, May 3-6, Pages: 463-466, Vol. –I].

Regarding claim 5, Gysel et al further suggest optimally adapting the poles of the IIR filter to the existing system surroundings with the process set forth by Kaelin et al [Gysel et al; col. 14, lines 20-26], wherein Kaelin et al teach a recursive process to determine the optimal poles of an IIR filter based on an error input signal, e(k), as shown in Fig. 1 [Kaelin et al; Abstract; Fig. 1; PP. 463-466]. No details on monitoring

the error input signal are disclosed by the combination of Gysel et al and Keilin et al. So one of ordinary skill in the art would have been motivated to seek any known method suitable to monitor the error signal, such as the method of Dowling, as shown in Fig. 9, wherein Dowling teaches monitoring an error input signal , E(Z), [See Fig. 6], for determining the adequacy of the echo canceller filter, G(Z), for providing a stopping criterion [col. 34, lines 14-30].

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the method of Dowling to monitor the error input signal, e(k), and use a threshold (not shown) to the error signal with the combination of Gysel et al and Kaelin et al to decide when to stop the recursive process of Kaelin et al (i.e. **re-determining the predetermined number of filter coefficients)** [Dowling: col. 34, line 27-30].

Allowable Subject Matter

15. Claims 14-16 are allowable.

16. The following is an Examiner's Statement of Reasons for the indication of allowable subject matter:

Currently amended claim 14 identifies the uniquely distinct feature of an adaptive filter comprising: a finite impulse response (FIR) filter having a plurality of FIR coefficients wherein the FIR coefficients are initially determined by deriving a FIR filter

having a predetermined number of coefficients , obtaining convergence of the FIR coefficients, dividing the FIR coefficients into a **first set** of FIR coefficients and a **second set** FIR coefficients, and converting the second set of FIR coefficients into infinite impulse response (IIR) coefficients. As such, claim 14 requires dividing the total coefficients of a selected FIR filter into a **first set** of FIR coefficients and a **second set** FIR coefficients, and then converting the second set of FIR coefficients into infinite impulse response (IIR) coefficients. While the closest prior art, Gysel et al [US 5,633,863], Johnson [US 6,141,406], Li [US 6,549,587 B1] and Sugiyama [US 2002010981 A1] each teach a FIR filter in combination with an IIR filter; none of them show or suggest dividing the FIR coefficients into a **first set** of FIR coefficients and a **second set** FIR coefficients, and then converting the second set of FIR coefficients into infinite impulse response (IIR) coefficients. As such, the prior art, either singularly or in combination, fail to anticipate or render the above underlined limitation obvious. Therefore, claim 14 is allowable.

17. Claims 15-16 are allowable due to dependence from claim 14.

Conclusion

18. THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ramnandan Singh whose telephone number is (571) 272-7529. The examiner can normally be reached on M-TH (8:00-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tran Sinh can be reached on (571) 272-7564. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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